Appendix E-6: Whidbey

Figure E-6.4 Whidbey Sub-basin pocket estuary locations, likely Chinook functions, and observed stressors

Pocket Estuary Identifier	Latitude	Longitude	Photo ID #	Freshwater (Y/N)	Likely Chinook Functions			Shoreline Development	Urbanization	Diking and Filling	Susceptibility to spills and discharges	Aquaculture related substrate alterations	Vulnerability to Sea Level Rise	Final Chinook Function Score		
					Feeding	Osmoreg.	Refuge									
WH1 - Similik	48.45	122.547	010411-122140	Y	x	x	x						x	PF	PF = Property Functining	
WH2 - Tosi Point	48.407	122.552	010525-144838	Y	x	x	x							PF	NPF=Not Properly Functioning	
WH3 - Onamak Pt.	48.184	122.533	010512-122326	N				x		x				NPF	AR=At Risk	
WH4 - Elger Bay	48.131	122.468	010512-122744	Y	x	x	x	x		x				AR		
WH5 - Triangle Cove	48.2	122.473	010512-120322	Y	x	x	x	x		x	x	x	x	AR		
WH6 - Livingston 1	48.214	122.444	010512-120736	Y	x		x	x		x			x	AR		
WH7 - Livingston2	48.222	122.449	010512-120754	N										NPF		
WH8 - Warm Beach	48.164	122.369	000924-115638	Y	x	x	x	x	x	x	x		x	AR		
WH9 - Tulalip Bay	48.054	122.281	000924-120518	Y	x	x	x	x	x		x		x	AR		
WH10 - Honeymoon Bay	48.053	122.546	010411-105158	N			x	x		x			x	AR		
WH11 - Race Lagoon	48.193	122.597	010411-110140	N			x	x		x	x		x	AR		
WH12 - Penn Cove 1	48.226	122.73	010411-113426	N			X	x		x			x	AR		
WH 13 - Penn Cove 2	48.233	122.733	010411-113438	N			x	x		x			x	AR		
WH14 - Crescent Harbor	48.296	122.61	010411-114848	Y				x		x	x		x	NPF		
WH15 - Strawberry Marina	48.289	122.517	010411-115358	N				x	x	x	x		x	NPF		
WH16	48.35	122.572	010411-115850	N				x	x	x	x		x	NPF		
WH17 - Dugualla Bay	48.353	122.6	010411-115938	Y		x		x		x	x		x	NPF		

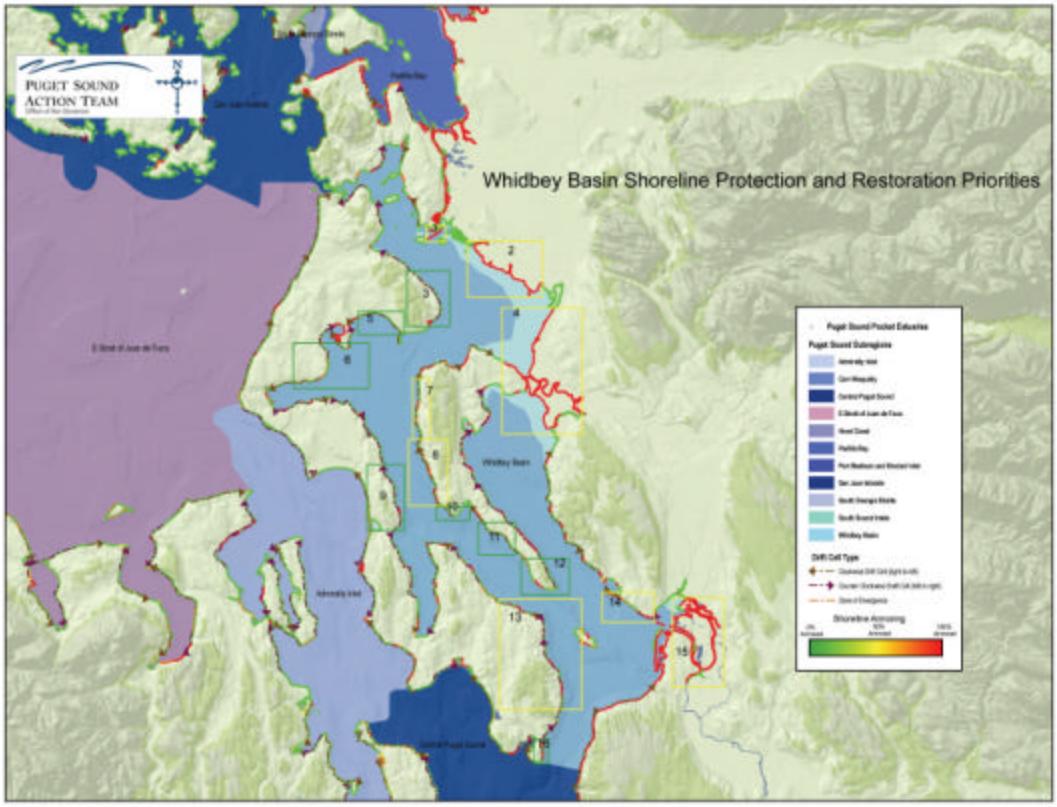

Figure E-6.5 Whidbey Sub-basin analysis of drift cells and shoreline armoring

Whidbey Basin

Box 1 – The Corps of Engineers dike along the entrance to Swinomish channel is likely interfering with natural deltaic and longshore sediment transport processes as well as tidal circulation in this region with unknown effects on salmon VSPs. Evaluation of that structure in the context of both watershed scale and sub-basin scale ecosystem restoration planning should continue to address possible salinity and other physical barriers to salmon migration, especially any barrier for Skagit river fish to rear in Padilla and Samish Bays.

Boxes 2 and 4– Existing agricultural dikes on the seaward edge of the Skagit and Stillaguamish deltas likely inhibit further delta formation into Skagit Bay and Port Susan. Deltaic processes historically dominated much of the Whidbey Basin's eastern shoreline. In light of the massive scale of direct juvenile rearing habitat loss within the historic delta itself and continued productive agricultural land use, the importance of restoration of deltaic processes to create "neo-deltas" in Skagit Bay should be considered. This may include both strategic dike removal and water diversions along historic or new distributary channels.

Box 3 – This bluff serves as a feeder source for long, continuous drift cells to the north toward Deception Pass. The depositional area of the first and largest of these cells interacted historically

with the deltaic processes of Dugualla Bay. Since the construction of the road on top of that depositional feature, the longshore processes alone maintain that structure presently.

Box 5 - This bluff serves as a feeder source for a continuous drift cell, which protects the City of Oak Harbor sewage treatment plant and several extensive pocket estuaries. Interruption of sediment transport processes within this cell could lead to erosion of the marsh in which the sewage treatment plant lagoons are located as well as a marsh on the west side of Maylor Point.

Box 6 – Blowers bluff is the sediment source for a drift cell that creates a large intertidal shelf within Oak Harbor to the north and a drift cell into Penn Cove to the west where the longshore sediment transport processes interact with deltaic processes from two small pocket estuaries.

Boxes 7, 8 and 10 – Boxes 7 and 8 act essentially as one long drift cell on the west shoreline of Camano Island. Much of the existing functions of this drift cell could be maintained with limited restoration of drift functions along some of the armored portions. However, the feeder source for this drift cell is located within box 10, located entirely within Camano Island State Park.

Box 9 – This is the feeder source (North bluff/Pratt bluff) for a drift cell that travels north along the eastern shoreline of Whidbey Island and another that travels south toward Dines Point, the northern boundary of Holmes harbor. The northern drift cell interacts with stream mouths to form two pocket estuaries. The southern drift cell supplies a low broad intertidal shelf that historically interacted with deltaic sediments. The depositional section of this southern drift cell now contains a number of low-lying houses that could be at risk of flooding if sediment transport were interrupted.

Boxes 11 and 12 – The southern Camano Island shoreline is a high bluff feeder source for an extensive drift cell that travels north to Elger Bay on the west Camano shoreline and northward toward Port Susan on the eastern Camano shoreline. The limited amount of armoring present on this shoreline does not occur at a scale that is like to interrupt sediment transport processes.

Box 13 – This large drift cell starts at the southern tip of Whidbey Island and continues northward along the eastern shoreline to Sandy Point. While much of the drift cell is unarmored, many waterfront property owners have built bulkheads seaward of the mean high water line and several have built cross-shore structures specifically designed to interrupt longshore sediment transport processes. This shoreline should be investigated for alternative shoreline treatments that would provide protection for upland properties without interrupting the drift cell. Aggressive education of waterfront property owners and bulkhead contractors should be considered in order to improve shoreline management practices if and when bulkheads need to be replaced. Island County should implement critical areas ordinances and shoreline management that acknowledges the natural littoral drift processes in this cell.

Box 14 and 15– The shoreline within box 14 is the divergence of two drift cells, one traveling north to form the spit separating Tulalip Bay from Possession Sound and the other traveling south toward the mouth of the Snohomish River. The northern drift cell appears to have a low

level of armoring currently and should be protected in its natural state to continue that function. However, there is a great deal of armoring throughout the southern drift cell. It is expected that the shoreline adjacent to a large river delta would be extremely dynamic over time. Construction projects that maintain the river mouth for navigation have probably added to that instability. The leveed islands inside the Snohomish delta should be considered for restoration of tidal influence, but the interaction between deltaic sediments reaching Possession sound and the southern drift cell within box 14 should be considered in conjunction with such restoration. It is likely that juvenile salmon migrating from the Snohomish River would heavily use this shoreline.

Other Whidbey Basin shorelines – There are many smaller drift cells that travel both north and south along the Whidbey Basin shoreline. The feeder sections of those drift cells may be extremely small because of the sheer volume of the high bluffs. The southern facing feeder bluffs are particularly active because of long fetches exposed to the main basin of Puget Sound. As development pressure continues along already armored shorelines, it will be important to integrate protection and restoration strategies that take into effect the complex interactions between the many freshwater outflow sources and long, continuous drift cells. The more interior portions of the Whidbey Basin such as Holmes Harbor, Penn Cove and Livingston Bay may be susceptible to eutrophication, so, the impacts of sewage and septic nutrient inputs should also be considered in relation to the net drift of nearshore waters and total oceanographic residence time.